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Swenson

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(54) **METHODS OF MOLDING MULTI-LAYER POLYMERIC ARTICLES HAVING CONTROL OVER THE BREAKTHROUGH OF THE CORE LAYER**

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(56) **References Cited**

U.S. PATENT DOCUMENTS

2,418,856 A 4/1947 Stacey
3,339,240 A 9/1967 Corbett
(Continued)

FOREIGN PATENT DOCUMENTS

EP 0311160 A2 4/1989
EP 0419829 A3 11/1991
(Continued)

OTHER PUBLICATIONS

International Search Report and Written Opinion of the International Searching Authority for International Application No. PCT/US2011/027594, mailed Sep. 20, 2012.
(Continued)

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(57) **ABSTRACT**

Disclosed herein are methods and systems for co-extruding multiple polymeric material flow streams into a mold cavity to produce a molded plastic article. At least one interior core stream of a first polymeric material is surrounded by inner and outer streams of at least one other polymeric material. The interior core stream serves as an interior layer of a resultant molded plastic article while the inner and outer streams serve as inner and outer layers, respectively, of the resultant plastic article. The interior core stream is selectively directed to flow into or past a downstream branch channel in a mold cavity. The downstream branch channel branches from a primary channel in the mold cavity at a branch junction. The branch channel defines a protrusion portion of the resultant molded plastic article. The leading edge of the interior core stream is selectively controlled in the branch channel to position the leading edge at or near to the terminal end of the branch channel without having the leading edge of the interior core stream breakthrough a flow-front of the inner and outer streams. The resultant molded plastic article includes an interior layer formed of the first polymeric material that extends into, through and to a distal end of the protrusion while still being encased by inner and outer layers formed from the inner and outer flow streams.

17 Claims, 22 Drawing Sheets